Supplemental Document

Biomedical Optics EXPRESS

Measurements of slow tissue dynamics with short-separation speckle contrast optical spectroscopy: supplement

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Supplement DOI: https://doi.org/10.6084/m9.figshare.23942598

Parent Article DOI: https://doi.org/10.1364/BOE.497604

1. CHOOSING THE g_1 MODELS FOR SLOW TISSUE DYNAMICS

The scattering regimes and particle motion types for blood flow dynamics have been well discussed in the literature[1, 2] and can be adapted to characterize the slow tissue dynamics we are investigating. The field autocorrelation function $g_1 = exp[-(\frac{\tau}{\tau_{c2}})^n]$ with $n = 0.5, 1, 2$ was applied to derive the corresponding speckle contrast models [2]. We evaluated the post-euthanasia mouse data at $T_{exp} > 1s$ in order to reduce the effects of blood flow. Then we fitted the data with different speckle contrast models with a single decorrelation time τ_{c2} as described in [2]. Fig. S1 shows that the speckle contrast model based on $g_1 = exp[-(\frac{\tau}{\tau_{c2}})^n]$ with $n = 1$ has the best fitting accuracy compared to models with $n = 0.5$ and $n = 2$, suggesting that the slow tissue dynamics measured with ss-SCOS is dominated by single scattering with unordered motion or multiple scattering with ordered motion [1]. Note that the ROI in the brain surface was selected in the region of parenchyma with small vessels.

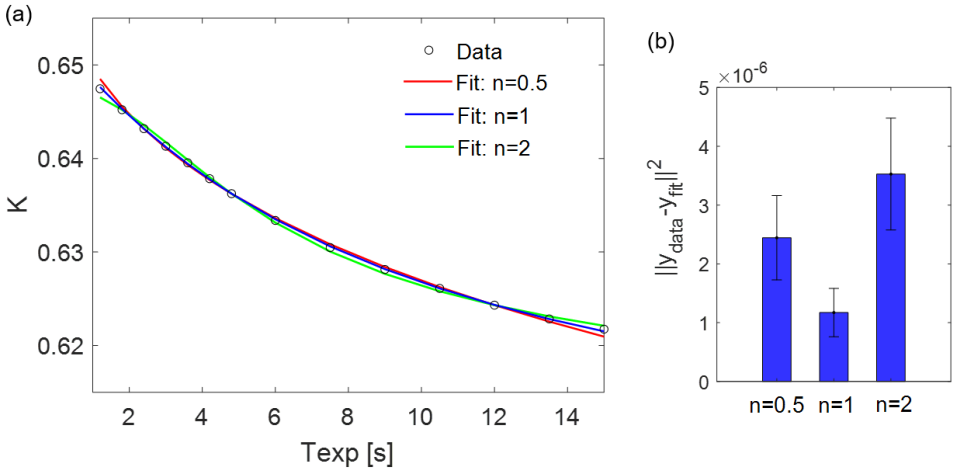

Fig. S1. Comparison of slow tissue dynamics fitted with different g_1 models. (a) Post-euthanasia mouse data (50 minutes after pentobarbital overdose injection) and the fitting curves with different g_1 models. (b) Fitting residual norm $||y_{data} - y_{fit}||^2$ for different g_1 models. The error bar represents the standard error of 5 repetitive measurements.

REFERENCES

1. D. D. Postnov, J. Tang, S. E. Erdener, K. Kılıç, and D. A. Boas, "Dynamic light scattering imaging," Sci. advances **6**, eabc4628 (2020).
2. C. Liu, K. Kılıç, S. E. Erdener, D. A. Boas, and D. D. Postnov, "Choosing a model for laser speckle contrast imaging," Biomed. Opt. Express **12**, 3571–3583 (2021).